**Name:**

**Date:**

**5.1bcd measurement**

**Measurement Centers**

**Distance**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure** | **Estimate** | **Actual** | **Difference** |
| Length of a pencil |  |  |  |
| Width of a desk |  |  |  |
| Your height |  |  |  |
| Length of the whiteboard |  |  |  |
| Shoulder to fingertip |  |  |  |

**Time**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Time** | **Estimate** | **Actual** | **Difference** |
| Tie a shoe with eyes closed |  |  |  |
| Snap fingers in 30 seconds |  |  |  |
| Say the alphabet backwards |  |  |  |
| Number of days between art classes |  |  |  |

**Temperature**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Temp.** | **Estimate** | **Actual** | **Name of Tool** |
| 0 min. |  |  |  |
| 2 min. |  |  |
| 4 min. |  |  |
| 6 min |  |  |
| 8 min |  |  |
| 10 min. |  |  |

**Mass**

**Gizmo Warm-up**

On the *Weight and Mass* Gizmo™, you can use a **balance** to compare the masses of objects.

1. Place the **dog** on the right pan of the balance. What happens?
2. Place the **5-kilogram (kg) mass** on the other pan. Which has more mass, the dog or the 5-kg mass?
3. The 5-kg mass is heavier than the dog, so take it off the pan and place a 1-kg mass on the pan. Add 1-kg masses to the left pan until it goes down. Then take one of the 1-kg masses off the pan so that the masses are above the dog.

Use this process of adding and subtracting other masses from the left pan until the two pans are balanced. Add up all the masses on the left pan. This is equal to the mass of the dog.

1. Collect data: Measure the weights of the following objects on Earth, the Moon, Mars, and Jupiter. Record your measurements in the data table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Pumpkin** | **Dog** | **Watermelon** |
| Weight on Earth |  |  |  |
| Weight on Moon |  |  |  |
| Weight on Mars |  |  |  |
| Weight on Jupiter |  |  |  |

1. Analyze: Does the weight of an object change when it is moved to a different planet?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Extend your thinking: Which celestial body had the strongest gravity, Earth, the Moon, Mars, or Jupiter? Explain how you know. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question: How is a triple beam balance used to find mass?**

1. Observe: The riders have masses of 10 grams (top), 100 grams (middle), and 1 gram (bottom). Drag the **10-gram rider** to **100**. At this position it balances a 100 gram mass.

What happens to the **pointer**?

1. Compare: Place each object on the measurement tray, one at a time. Which objects have a mass greater than 100 grams? How do you know?

1. Compare: Move the **10-gram rider** back to **0**, and move the **100-gram rider** to **200**.
   * 1. Which objects have a mass greater than 200 grams?
     2. Which objects have a mass greater than 300 grams?
2. Calculate: Place the light bulb on the pan and find its mass.The mass of the light bulb is the sum of the values on each rider. To get a magnified view of the **1-gram rider**, place the cursor over that rider. (Each tick mark represents 0.1 g.) Write your answer to the nearest 0.1 gram.

100-g rider: 10-g rider: 1-g rider:

Mass of the light bulb: ­­­

1. Practice: Use the Gizmo to find the mass of the other objects. Write their masses below.

Paper clips: Cone: Cube:

**Volume**

To begin, remove the **50-mL graduated cylinder** from the cabinet and place it below the faucet. To turn on the faucet, click on the faucet handle. Fill the cylinder about halfway.

1. Place the **magnifier** over the waterline. What volume is represented by each small tick mark?
2. What is the shape of the waterline?

This curved shape is called the **meniscus**. Always read the volume at the bottom of the meniscus.

1. What is the volume of water in the graduated cylinder? \_\_\_\_\_\_\_\_\_\_

**Introduction: Graduated cylinders** are precise tools for measuring volume. Most graduated cylinders are marked in **milliliters**. There are 1,000 milliliters in 1 liter (about two cups).

**Goal: Fill a graduated cylinder with a given amount of water.**

1. Prepare: Place the **250-mL beaker** below the faucet and fill it with water. (Move the faucet handle up to pour faster.) You will use the beaker as a source of water in your experiments.
2. Measure: To pour water from the beaker to the graduated cylinder, move the beaker over the graduated cylinder. Add about 15 mL of water to the graduated cylinder (does not have to be exact).

Place the **magnifier** over the waterline.

1. How many medium tick marks lie between two labeled tick marks? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How much volume does each medium tick mark represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How much volume does each small tick mark represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Estimate the water volume in the graduated cylinder to the nearest 0.1 mL.

(Remember to read from the bottom of the curved meniscus.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Measure: Scientists use **pipettes**, also known as eyedroppers, to add or remove small amounts of water. To fill the **pipette**, place its tip in the beaker water and click the black bulb once.

To release a small amount of water, place the pipetteabove the graduated cylinder and click the bulb. Do this until the graduated cylinder contains exactly 17.5 mL of water. (Remember to read the volume at the *bottom* of the meniscus.)

1. Show your work: Take a screen shot of the image. Label this image “17.5 mL.”

**Activity A (continued from previous page)**

1. Practice: Use the Gizmo to complete each of the following challenges. When you have finished each one, take a screen shot and add it to your document. Label each image with the volume.
2. Fill the **25-mL graduated cylinder** with 11.5 mL of water.
3. Fill the **100-mL graduated cylinder** with 76.0 mL of water.
4. Fill the **50-mL graduated cylinder** with 38.5 mL of water.
5. Think and discuss: Suppose you needed to measure exactly 15.0 mL of water for an experiment. Which graduated cylinder would be the best one to use, and why?
6. Further practice: Select the **Practice** button. In this mode, the Gizmo will give you a series of challenges. When you complete a challenge, click **Submit**. Click **Reset** if you would like to start over or try a problem again. As you practice, the Gizmo will keep a tally of right and wrong answers in the green and red circles.

Complete the first six challenges. Stop when you see the **ruler** and **sphere** (ball) on the screen.